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Complex Trees: Structural Stability of Connected Self-similar Sets

The theory of complex trees is introduced as a new approach to study a broad class of self-similar sets which includes Cantor sets, Koch curves, Lévy C curves, Sierpinski gaskets, Rauzy fractals, plane-filling curves, and fractal dendrites. We note a fundamental dichotomy for n-ary complex trees that allows us to study topological changes in regions where one-parameter families of connected self-similar sets are defined. Moreover, we show how to obtain these families from systems of equations encoded by tip-to-tip equivalence relations. The parameter space maps that we introduce to study these families of connected self-similar sets are new. And for $T_A(z) := T\{z, \frac{1}{2}, \frac{1}{4z}\}$ we show that the boundary surrounding structurally stable trees is piecewise smooth.